DEPARTMENT OF APPLIED ECONOMICS

RESEARCH REPORT

ADAPTATION AND SURVIVAL IN NEW BUSINESSES: UNDERSTANDING THE MODERATING EFFECTS OF (IN)DEPENDENCE AND INDUSTRY

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OR 0461

Adaptation and survival in new businesses: Understanding the moderating effects of (in)dependence and industry

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Subject classifications:

D83	search, learning, information and knowledge
M13	entrepreneurship
O32	management of technological innovation and R&D

ABSTRACT

New ventures as well as new business units experience significant difficulties in finding a viable market application or business model. They often need to adapt their initial business model and this need for adaptation is mainly due to high degrees of uncertainty and ambiguity they are confronted with. This paper hypothesizes that adaptation is crucial for new ventures' and new business units' survival, but that differences exist between the need for adaptation in business units of established companies versus in independent start-ups. According to insights obtained from institutional isomorphism as well as from the resource-based theory of the firm, the effects of adaptation on survival are complex and multifaceted. We test the adaptation-survival hypothesis through a survival analysis of a sample of 117 new ventures and new business units. We find that the main effect of adaptation on survival is negative, but that this effect is moderated and even reversed by the (in) dependence of the new business and by the industry in which it is active.

INTRODUCTION

One of the most pertinent questions in the field of entrepreneurship research, as suggested by Venkataraman (1997, p. 121) is *"...why, when and how some [entrepreneurial companies] are able to discover and exploit opportunities while others cannot or do not"*. Various authors have put forward that it is not the clairvoyance of the entrepreneur or intrapreneur that determines this ability. There exists evidence that most initial selections of market applications by new businesses have to be abandoned later on and that minor or major adaptations to the initial business model are needed.

Pitt and Kannemeyer (2000) question whether many entrepreneurs are able to define the concept correctly from the outset. To paraphrase Stoica and Schindehutte (1999: p. 1): "Entrepreneurs start with a vision. ... When successful it is because they are able to translate this vision into a business concept that addresses a marketplace need. ... only in a minority of cases do entrepreneurs succeed because they define their concept correctly from the beginning, and rarely do they immediately achieve a good fit between the available opportunity and their approach to the business concept." Or as Peter Drucker (1985: p. 189) has noted: "*When a new venture does succeed, more often than not it is in a market other than the one it was originally intended to serve, with products and services not quite those with which it had set out, bought in large part by customers it did not even think of when it started, and used for a host of purposes besides the ones for which the products were first designed.*" Existing research data confirms this. Brokaw (1991), in her update of the twenty seven ventures that were profiled in Inc.'s "Anatomy of a Start-up" series between the period of 1988 and 1990, found that by 1991, a large fraction of the surviving ventures had adapted their initial business model: "*What has made or broken many of the companies we've watched...is... the ability (or inability) to recognize and react to the completely unpredictable... To be flexible, and not just in response to small surprises but to really big ones - like discovering you're selling to the wrong customers or selling through entirely wrong channels. Some companies even find they have to revamp from top to bottom in order to survive. They discover they're in the wrong business*" (Brokaw, 1991: p. 54).

Although the importance of adaptation for new ventures is widely accepted, relatively little research has been done to investigate the precise effect of the initial business model's adaptation on the survival of new businesses. Stoica and Schindehutte (1999) investigate the relationship between adaptation and performance, and a number of factors and activities enabling adaptation. Although their research study provides interesting results, we do not believe the sample - where the typical firm has been in business between 5 and 25 years, and has fewer than 100 employees - to be representative of 'new' ventures or business units. Pitt and Kannemeyer (2000) use a sample of companies less than five years old. However,

they study the effect of personality traits (intolerance of ambiguity, locus of control, and risk taking propensity) on the degree to which marketing strategy had changed, but do not investigate the relationship between adaptation and performance or survival, nor any factors that might affect this relationship. Morris et al. (1999) do suggest that ambiguity, risk and the entrepreneur's control over key variables influence the need for adaptation in entrepreneurial companies, but they do not investigate these effects empirically. To our knowledge, existing work takes for granted the need for adaptation in new businesses, and does not pay sufficient attention to company and industry characteristics that may influence this need.

We should note that the concept of adaptation described above is different from the one used in literature on established companies (see for example the work of Tuominen et al., 2002; Oktemgil and Greenley, 1997; Hrebiniak and Joyce, 1985, Van de Ven and Poole, 1995, Jankowicz, 2000, Burgelman, 1991). The latter regards adaptation as an organization's response to changes in external factors, threats and opportunities. Organizational adaptation or change is then defined as *"...change in a significant organizational attribute, such as basic business strategy or organizational structure in response to environmental changes..."* (Kraatz, 1998). While Kraatz' definition of adaptation suggests that companies need to adapt to changes in their environment, the entrepreneurial adaptation on which this paper focuses is needed regardless of environmental change. It is about entrepreneurs and ventures who need to find their place in the environment, or even about them finding the most appropriate environment. Therefore, we cannot readily apply insights on adaptation in established firms to new businesses.

Based on this overview, it is obvious that the relationship between adaptation and survival in new businesses – alongside potential moderating factors – deserves further research. If the need for adaptation in order to survive is moderated by company and industry characteristics (as suggested by Morris et al., 1999), then adaptation strategies - and maybe also the specific enablers for adaptation - should be made contingent on these characteristics. The aim of this paper is to look at the effects of these company and sector characteristics. Firstly, we discuss the difficulty new businesses have in finding a viable market application or business model. We suggest that they need to adapt their initial business model and that this need for adaptation is mainly due to high degrees of uncertainty and ambiguity they are confronted with. We hypothesize that adaptation will be crucial for new business' survival. Secondly, we hypothesize that the need for and the survival effect of adaptation differs between business units of established companies and independent start-ups. Thirdly, hypotheses are formulated with respect to the direct and moderating effect of sector characteristics. Finally, we test these hypotheses through survival analysis of a sample of 117 new businesses, controlling for industry effects.

LITERATURE OVERVIEW

New businesses on the search for viable market applications

New businesses often start from a vision or from a technological capability. In both cases, the initial idea needs to be translated into an economic reality through the development of a business model (Chesbrough and Rosenbloom, 2002). The business model is then considered a construct that mediates the value creation process, by selecting and filtering technologies and ideas, and packaging them into particular configurations to be offered to a chosen target market. The functions of a business model are *"to articulate the value proposition, identify a market segment, define the structure of the value chain, estimate the cost structure and profit potential, describe the position of the firm within the value network, formulate the competitive strategy"* (Chesbrough and Rosenbloom, 2002: p. 533-534). This definition corresponds to the notion of 'market application', and in the remainder of this paper, the terms business model and market application will be used interchangeably.

Because both technical and market uncertainty are involved in this translation and because environments may change rapidly, the set of all feasible business models is not foreseeable in advance (see also the work of Druilhe and Garnsey, 2002 and 2004 on university spin-outs). This difficult search for viable market applications is largely due to the uncertainty and ambiguity new businesses are confronted with. This is especially the case for technology-based businesses that are coping with high degrees of both technical and market newness (see also Morris et al., 1999; Shane and Stuart, 2002). Certainly during the early stages in its life, a new business is confronted with high degrees of both uncertainty and ambiguity while having access to a limited knowledge and experience base and while experiencing restricted access to resources as it tries to bring a new product or service application to the market (see for example: Bhidé, 2000). The underdeveloped resource base of the new business may hence negatively affect its chances for survival and subsequent performance (Wernerfelt, 1984). When initially developing a market application, the business often faces uncertain innovation targets, unclear product performance requirements and ambiguous design criteria. Innovations are by definition only successful when they succeed in coupling a technological capability to a user need (Teubal et al., 1991). During this process, innovations face considerable selection pressures on their way to commercialization (Nelson and Winter, 1982). Not only is the nature and the outcome of the technical activities inherently unpredictable (Steensma et al., 2000), but also the market selection and commercialization process itself poses problems of uncertainty and ambiguity (Chesbrough, 2003; Chesbrough and Rosenbloom, 2002; Chesbrough, 2002). Utterback (1987) therefore

distinguishes between technical and target uncertainty. There is some evidence that uncertainty with respect to markets has an even larger effect on the development of opportunities than technological uncertainty (Eisenhardt and Schoonhoven, 1990; Autio and Lumme, 1989; Saemundsson and Lindholm Dahlstrand, forthcoming). The range of options - and problems - that founders of new businesses confront is vast. Entrepreneurs and intrapreneurs must continuously ask what application they want to strive for and what competencies they need to develop in order to accomplish that prowess (Bhidé, 1996). In emergent markets, technological options are at best marginally understood, distribution channels and sources of supply are problematic, market needs are not clearly defined, and hence, market viability cannot be proven a priori (see Abernathy and Utterback, 1975 & 1978; Debackere, 1997; Eisenhardt and Schoonhoven, 1990; Bhidé, 1992, 1994, 1996 & 2000; Teubal et al., 1991). These uncertainties and ambiguities can also be seen as corollaries of the liabilities of smallness and newness new businesses are facing (see Hannan and Freeman, 1977, and Stinchcombe, 1965 for their respective original definitions).

As a logical consequence, it is not possible for a venture to identify upfront what will be the most viable business model or market application. Uncertainty and risk induce the need to change the business model (Pitt and Kannemeyer, 2000). In general, high levels of uncertainty are known to require adaptive organizational processes (Timmons et al., 1990). Market signals may reveal information about the external environment that was unknown or uncertain at the outset, indicating a possible need to change or adapt the initial business model (Stoica and Schindehutte, 1999). As Stoica and Schindehutte (1999) put it: *"The adaptive entrepreneur allows the business concept to develop over time as he/she gains experience with products, markets, suppliers, employees, and other key variables surrounding the enterprise"* (Stoica and Schindehutte, 1999: p. 1-2). In the context of new venture development, adaptation thus refers to the entrepreneur's willingness and ability to make appropriate adjustments to the business concept and marketing approach as the venture evolves from an initial idea or business plan through the early stages of the organizational life-cycle towards a more stable business (Morris et al., 1999; Pitt and Kannemeyer, 2000).

Literature on established firms (McGee, Varadarajan & Pride, 1989) as well as on new ventures points to the danger of not only 'under-adaptation', but also 'over-adaptation'. As explained by Stoica and Schindehutte (1994, p.7): 'under-adaptation can lead to unintended costs (especially inventory), low customers, and missed opportunities. Over-adaptation utilizes resources unnecessarily, may find the firm under-emphasizing its core business, and frequently finds the firm pursuing courses of action that do not generate requisite payoffs.' Stoica and Schindehutte (1994) propose that the danger of over-adaptation is especially present in entrepreneurial businesses. They point out that entrepreneurs are opportunists, but

that resource constraints limit the thorough analysis of these new opportunities. It is thus not unlikely that they will spread out their resources too thin over various opportunities, reducing the possibility to succeed in any of them. We therefore hypothesize that:

H1: There is an inversed u-shaped relationship between adaptation of a new business' business model and its survival.

Effects of the new business' background or heritage

Differences in the need for adaptation may arise between businesses with different backgrounds or heritages. Some research suggests that new business units of existing companies will have fewer problems defining a viable market application or business model – and thus less need for adaptation - than independent start-ups. In his study of the internal corporate venturing process, Burgelman (1983) shows how the initiation of the project definition process involves technical linking as well as need linking activities. While the new product, process, or system is still in the definition process, market interest already needs to be created. Burgelman observes that unauthorized selling efforts are started even before the project becomes an official venture. This is only possible because group leaders have direct involvement in research activities and sufficient awareness of market needs. Also Zucker et al. (2002) find that new biotech units of established firms obtain more and higher-quality patents than new entrants. Since patents need to demonstrate potential practical applicability, this could be considered an indication that new units of established firms are better at making a first step towards technology commercialization.

There is a two-pronged argument stemming from institutional isomorphism that should be understood here. Based on institutional isomorphism (DiMaggio and Powell, 1983), we might expect significant 'imprinting' from the mother organization on the new business unit. This imprinting can provide the new business unit with significant up front knowledge on technologies, markets and organization itself. This up front knowledge can be hypothesized an advantage when the new business unit will be operating in product-market environments in which it can benefit from this imprinting. Under those circumstances, the new business unit will need less adaptation to survive. There is a darker side to this argument as well, though. Institutional isomorphism also implies a certain degree of inertia: administrative heritage shapes patterns and routines in the new business unit that makes it more difficult for the business unit to adapt. Hence, in those circumstances where the new business unit will be operating in a new product-market environment where the imprinting becomes a liability rather than an asset, adaptation will become highly relevant and

necessary. Unfortunately, precisely because of the imprinting that has taken place, this adaptation may be more difficult and hence survival less guaranteed.

As a consequence, it does not astonish that quite some research insights evidence point to the need for intrapreneurs to be equally adaptable. In one of the corporate ventures studied by Burgelman (1983), the initial focus of the project to improve plastics turned out to be on bottles of the wrong size. Although a basis for corporate support had been acquired, adaptation was necessary. Chesbrough (2002) even suggests that corporate ventures need to be even more adaptable than independent start-ups, because they need to free themselves from the dominant business logic of the parent company. In his study of 35 Xerox spin-offs, he found that *"...those spin-offs that became successful did so through evolving business models that came to differ substantially from that of Xerox..."* (Chesbrough, 2002, p. 529). In his review of different literature streams on employee startups in high-tech industries, Klepper (2001) points out that incumbents have serious difficulties in assessing and implementing certain types of innovation, such as architectural innovations (Henderson and Clark, 1990), competence-destroying innovations (Tushman and Anderson, 1986) and innovations that appeal to new users due to reliance on feedback from current customers (Christensen, 1993). This suggests that new business units of established firms might, under certain circumstances, even experience greater difficulties than independent start-ups in defining the initial business model and therefore will need to be more adaptive afterwards. These findings are in line with the arguments as they emerge from institutional isomorphism as mentioned above.

Based on these insights, we hypothesize that:

> *H 2a: The effect of business model adaptation on failure rates differs between independent start-ups and business units of established corporations.*

In addition, the (in)dependence of the new business may have a direct effect on failure rates. The high mortality risk new ventures are facing is often seen as a consequence of liabilities they are confronted with from their conception onwards. In general, we can discern between the liabilities of smallness and newness. The liability of smallness hypothesis points to the relationship between size and mortality. The theoretic rationale behind this hypothesis dates back to Hannan and Freeman's original paper on population ecology (1977), in which they state that 'the appropriate time scale for a selection process increases with the size of the organizations under consideration'. Explanations for this phenomenon are related to the environment (given resource-based arguments) favoring organizations with structural inertia (Singh and Lumsden, 1990:176), scale effects (Barron et al, 1994:388), and to the availability of 'slack resources' in larger organizations (Haveman, 1993): financial resources (Berry & Taggart, 1998; Bhidé, 1992, 1994, 1996; Hite

& Hesterly, 2001), as well as human capabilities (Steensma et al., 2000; Baum et al., 2000; Mc Cartan-Quinn and Carson, 2003).

Complementary to this liability of smallness, the liability of newness is often identified as a major cause of mortality (Shepherd et al., 2000; for an overview see Eisenhardt & Schoonhoven, 1990). The theoretical explanation goes back to Stinchcombe's (1965) observations that new organizations have higher failure rates than older ones, which is known as the 'liability of newness'. Hannan and Freeman (1984) argue that in modern societies and markets (commercial as well as financial) organizations with high levels of 'reliability' and 'accountability' are favored by selection processes. New ventures lack a 'track record' with customers and suppliers (see also Hay et al., 1993), and the employees and founders of these ventures are not always able to quickly assume the new roles and relationships that are required from them in order to thrive. Business relationships with stakeholders need to be built, legitimacy and reputation need to be established, new employees must be recruited and trained (Lu & Beamish, 2001; Hite & Hesterly, 2001). Shepherd et al. (2000) suggest that this newness or novelty consists of novelty to market, novelty in production, and novelty to management. Hay et al. (1993) point to the existence of an 'asset accumulation gap' that ventures must close in order to satisfy early customers and outperform established rivals. Also Zahra et al. (2000) suggest that, even when offering a superior technology or product, ventures must learn new skills and competencies in order to position their products successfully and to survive. Also Bhidé (2000) points to the need for the new venture to quickly learn to develop and deploy organizational routines such as coordination mechanisms in order to cope with the environmental challenges they face.

The liabilities of smallness and newness both refer to a lack of resources, capabilities or knowledge within the new business. Whereas independent businesses need to acquire these resources, capabilities, and knowledge through learning (Shepherd et al., 2000), networking and partnering (Shepherd et al., 2000; Foray, 1991; Teubal et al., 1991; Baum et al., 2000), business units of established companies might benefit from the resources, capabilities and knowledge present in the parent organization. Bhidé (2000) shows how employees of established corporations who develop new initiatives, can use the cash flows, relationships, and reputation provided by existing businesses. This helps them to secure customers, employees and other resources for their start-up. Liabilities of newness and smallness will therefore be less an issue in business units of established companies than in independent start-ups.

Consequently, we should verify whether[i]:

> *H2b: New business units of established companies have lower failure rates than independent new ventures.*

Sector effects

In addition to the background of the new business, the sector in which it operates may have a direct and indirect effect on survival. Various studies have demonstrated that industry in characteristics have a significant effect on survival rates. Audretsch (1991) already showed that the existence of scale economies and a high degree of capital intensity lowers the likelihood of survival (see also van Praag, 2003 and Almus and Nerlinger, 1999 on the effect of external factors on growth and survival).

These industry characteristics may equally affect the need for adaptation of the initial business plan. Firstly, the maturity of the industry sector in which a technology-based venture operates – and more specifically the emergence (or not yet) of a dominant design (Utterback, 1994) – may influence the need for adaptation. In mature markets, dominant designs, process technologies, and strategies are clear. New businesses have few difficulties identifying the accepted, viable business model for the industry. Growth markets, on the other hand, are viable but turbulent. There may be multiple options for how to compete within an overarching dominant design. And in emergent markets, the timing of commercial takeoff and the viability of certain business models are impossible to predict. In immature industries, the unavoidable presence of ambiguity and risk may increase the need for adaptation (as suggested by Morris et al., 1999).

Secondly, the need for a new technology-based venture to adapt its initial business model may be influenced by the capital intensity of the sector in which it operates. One would logically reason that the need for large investments (R&D and other types) hinders shifts in business models. However, under these circumstances, the need for adaptation increases, since failure will lead to greater losses. Indeed, whereas a small financial loss will not immediately jeopardize survival, new businesses may not be able to overcome the obsolescence of large investments.

As we already noted, adapting various aspects of the business model may be necessary not only to find an appropriate place in the environment or to find the most appropriate environment; it is also necessary when environmental circumstances change (see for example the work of Tuominen et al., 2002; Oktemgil and Greenley, 1997; Hrebiniak and Joyce, 1985, Van de Ven and Poole, 1995, Jankowicz, 2000). In the latter case, established companies as well as new businesses may need to change course. Of important influence in this respect is the regime of technological opportunity in a sector. Technological opportunity *"can be regarded as the set of production possibilities for translating research resources into new techniques of production"* (Cohen and Levin, 1989, p. 214). It influences the pace and the direction of technical advance in

a broad sense and especially in the long run. Technical advance may be higher-paced in some industries than in others. If the industry's technology advances, established companies as well as new businesses will need to adapt their business model in order to remain competitive. We need to control for this type of adaptation since it is not what we are interested in for the current study.

We therefore want to verify whether:

H3a: The sector of the new business has a significant effect on failure rates.

H3b: The effect of business model adaptation on failure rates differs depending on the sector in which new businesses operate.

EMPIRICAL ANALYSIS

Data source

The unit of analysis is the new business. The data source used is the annual CorpTech directory. This directory provides information on technology businesses that operate in the United States, including those that are domestic- and foreign-owned, public and private, parent companies, and divisions. Each year, each firm is listed with (amongst other information) its product codes (CorpTech codes as well as SIC codes) and product descriptions. Sometimes sectors are mentioned multiple times, each time with a different product and/or service description. In addition, a short text describes the markets/industries the company is selling to, and whether or not it is a business unit of an established company. Both the textual description and the CorpTech codes, SIC codes and product descriptions indicate whether the company offers products, services or both.

Directories have been used as a data source in existing research (see for example Baum, Calabrese & Silverman, 2000; Lu & Beamish, 2001; Romanelli & Tushman, 1994). Data from the CorpTech directory have recently been used by Puranam and Srikanth (2004, working paper) to investigate the structural integration of acquisitions and by Lee (2004, working paper) to identify firms' entry into the network switching market. The main asset of the CorpTech directory is that it covers young as well as established, small as well as large, and private as well as public companies. Firms must be independently managed operations, although they may be divisions of larger entities. According to CorpTech, of a random sample of

200 emerging companies presented in the CorpTech directory between 1989 and 2003, 88% did not appear in D&B's Million Dollar directory, 77% were not mentioned in Wards' Directory, and 81% were missing from the Thomas register. CorpTech identifies firms from a variety of sources, including technology newsletters, industry (vertical) trade associations, technology related press clipping services, economic development agencies, manufacturers' directories, other databases and interviews with related manufacturers. When a previously unknown company is identified, an interviewer calls the company and conducts a fifteen to twenty minute interview, typically with a senior member of the sales or marketing staff. The interviewer formulates a profile, coding the products or services. The company is then requested to proofread the profile and correct any errors. Profiles are updated approximately once per year.

Sample

For each of the directory editions 1992 until 1996, we selected independent start-ups and (independently managed) business units of established companies that were listed for the first time in that edition, with a complete profile, and had been founded only one or two years prior to the edition. This means that the average business is only 1.5 years old when it enters our sample. Although we will not be able to capture the very early – and probably more frequent - changes in business model, previous case study research has shown that it can take ventures multiple years to find their first viable market application. Clarysse and Moray (2004) study an academic venture that adapts is business model over a period of four and a half years. Andries et al. (2004) in their study of academic as well as non-academic ventures, find that it can take ventures up to seven years to define a viable business model. We are therefore confident that with an average age of 1.5 years at entry, this sample will enable us to study this search and adaptation process.

Of these one and two year old companies, we selected the ones active in the automation, biotech and environmental industry. We selected these three sectors based on various criteria: firstly, they have a considerable number of independent as well as dependent start-ups. Secondly, these three sectors differ with respect to maturity and stability. Whereas the biotech industry is generally considered to be an emerging and rapidly developing sector, the automation industry has more the characteristics of a growth market, being viable but still somewhat turbulent. The majority of the companies in our environmental industry sample are active in traditional waste management and water treatment, characterized by some degree of maturity. Thirdly, there are almost no companies in the Corptech database that were active at start-up in more than one of these three sectors. New businesses that started out in more than one of these three sectors were removed from the sample. This selection criterion allows us to use dummy variables for

initial sector (see below). The use of these three criteria led to a total sample of 117 businesses. For each of them, we coded the CorpTech information from the first year they were listed in the directory until 2003 (if they were still listed as existing in the 2003 edition) or until the year they went out of business, were no longer traceable, or were taken over by another company. This led to a total number of 681 observations (or an average of about 6 observations per business). The distribution of the sample over CorpTech sectors and business background is given in Table I.

- INSERT TABLE I ABOUT HERE -

Variables

Outcome variables

We are interested in the survival of the company, as opposed to going out of business, or being taken over by another company. For each year, we code in the variable STATUS whether the company is alive, out of business, taken over by another company, or whether CorpTech was unable to recontact the company (in this case, the business probably no longer exists).

Explanatory variables

a) Company and sector variables

A dummy variable DEP is used to indicate whether a business is an independent start-up or a business unit of an established company. In order to correct for the effects of maturity, capital intensity and technological advance, we discern between three sectors: automation, biotech and environmental, represented respectively by sector dummies (SEC1 representing automation, and SEC2 representing biotech, with environmental as the comparison base). As explained above, these sectors where chosen to minimize overlap between them.

b) Constructing measures of adaptation

Two time-dependent variables $CMKT_t$ and $CCMKT_t$ represent respectively the change in target markets for a specific year and the cumulative change in target markets up to that year. Each year, we coded whether or not the target market has changed as a 0 (no change) or 1 (at least one change) compared to the previous year as CMKT. For each year, we then calculate the cumulative number of target market changes until that year as CCMKT. By coding cumulative changes, we intend to check whether there exist learning

effects with respect to adaptation of the business model. Indeed, we assume that a cumulative number of market changes will create experience effects within the company. This relates to the literature on dynamic capabilities and the resource-based view of the firm, in which organizational capabilities are described as high-level routines (Winter, 2000). A routine is 'a behavior that is learned, highly patterned, repetitious, or quasi-repetitious' (Winter, 2003). Repetition of a specific pattern of activity (see also Nelson and Winter, 1982) over long periods of time may hence have a cumulative or learning effect.

In addition, we coded whether or not the business has changed from targeting one to targeting more than one market or vice versa as $CHOM_t$ (CHOM=1 if there is a change from one to more than one target market or vice versa; CHOM=0 otherwise). Also here, a cumulative score is calculated as $CCHOM_t$.

We also coded whether the business changes between being a product company, a service company, or offering both services and products. A change in a certain year is coded as $CHPS_t$ =1 ($CHPS_t$ =0 otherwise). Also here, a cumulative score is calculated as $CCHPS_t$.

Similarly, we coded whether or not the CorpTech codes in which the business is active have changed compared to the previous year as a $CHCORP_t$ (= 0 if no change and =1 if at least one change). In the same way, changes in SIC codes are represented by the variable $CHSIC_t$, and changes in product or service description by the variable $CHPROD_t$. Also here, cumulative scores are calculated as $CCHCORP_t$, $CCHSIC_t$ and $CCHPROD_t$.

We saw that in the context of new venture development, adaptation refers to the entrepreneur's willingness and ability to make appropriate adjustments to the business concept and marketing approach as the venture evolves from an initial idea or business plan through the early stages of the organizational life-cycle towards a more stable business (Morris et al., 1999; Pitt and Kannemeyer, 2000). The business model is a construct that mediates the value creation process, by selecting and filtering technologies and ideas, and packaging them into particular configurations (i.e. products and/or services) to be offered to a chosen target market. The variables we coded up allow us to capture exactly these adjustments or changes with respect to products or services offered and target markets. The CorpTech data does unfortunately not allow us to capture changes with respect to technology[ii].

Control variables

We control for the size of the business. CorpTech provides us with the number of employees of the firm, represented by the variable EMPL. Unfortunately, for a number of business units of established companies, only the parent's number of employees was given and we had to remove these observations from the sample.

Analysis

Factor analysis

On our total sample of 117 business units and a total of 681 observations, we performed a factor analysis on the variables representing adaptation of the business model: $CMKT_t$, $CHOM_t$, $CHPS_t$, $CHCORP_t$, $CHSIC_t$, $CHPROD_t$, $CCMKT_t$, $CCHOM_t$, $CCHPS_t$, $CCHCORP_t$, $CCHSIC_t$ and $CCHPROD_t$. The basic statistics for these variables are presented in Figure 1. The results of the factor analysis are shown in Figure 2. The Kaiser-Meyer-Olkin measure of sampling adequacy is 0.69, which is sufficient for performing factor analysis (Sharma, 1996, p. 116). Using the cutoff criterion eigenvalues > 1, three factors were obtained. The rotated factor pattern shows that Factor 1 represents cumulative changes in products or services. Cumulative changes in CorpTech codes (CCHCORP), SIC codes (CCHSIC) and product description (CCHPROD) all have factor loadings for Factor 1 of about 0.9. CCHPS (cumulative changes from products to services or vice versa) has a factor loading of about 0.7. Factor 2 represents yearly changes in products or services. Yearly changes in CorpTech codes (CHCORP), SIC codes (CHSIC) and product description (CHPROD) all have factor loadings for Factor 2 of 0.9 and more. CHPS (yearly changes from products to services or vice versa) has a factor loading of about 0.6. Finally, Factor 3 represents changes (both cumulative and yearly) in target markets. CHMKT, CCHMKT, CHOM, and CCHOM all have factor loadings for Factor 3 between 0.71 and 0.78. These high factor loadings already point to the adequacy of the factor solution. In addition, the root mean square residual is 0.078, which appears to be small implying a good factor solution (Sharma, 1996, pp. 107).

- INSERT FIGURE 1 ABOUT HERE –
- INSERT FIGURE 2 ABOUT HERE –

Event history analysis

The standardized scoring coefficients that resulted from the factor analysis were used to calculate the scores on these three factors for each of the 681 observations in our sample. These scores were then drawn on in our further analysis of business survival. We applied event history analysis, and more precisely, Cox-regression with the counting process syntax (see Allison, 1995). Cox-regression does not require us to choose a particular probability distribution for survival times, increasing robustness. In addition, it allows for time varying covariates, ties, and multiple types of events. An advantage of the counting process syntax is that we can accommodate for the fact that some companies enter the dataset one year and others two year after being formed. It also allows us to include companies that disappear from the directory without an indication of what happened to them. They are treated as censored at the last-known date of their existence.

When preparing for our analysis, we found that of our 681 observations, 363 scored zero on Factor 1, Factor 2, and Factor 3, indicating that they had not adapted their initial business model in any of the years we documented. Descriptive statistics for the total sample, for the adapted sub-sample and for the sub-sample that did not adapt at all are given in Figure 3. Survival distribution functions for both sub-samples are shown in Figures 4. Survival curves are steeper for the non-adapted sub-sample than for the adapted sub-sample. The statistics in Figure 5 indicate that the probability of surviving is indeed significantly higher than for the non-adapted sub-sample ($p < 0.10$). In the our further analyses, we then investigated more in detail whether this difference in survival rates could actually be attributed to differences in adaptive behavior.

- INSERT FIGURE 3 ABOUT HERE –
- INSERT FIGURE 4 ABOUT HERE –
- INSERT FIGURE 5 ABOUT HERE –

The presence of a large number of non-adapted businesses and the related large number of zero values made estimation unreliable due to a lack of variability in the data. We therefore decided to perform Cox-regression on the sub-sample of 62 businesses which had undergone at least one change in business model, and therefore had at least one score for Factor 1, Factor 2, or Factor 3 different from zero in at least one year. This approach allows us to examine the effects of change on survival within the group of companies that adopted changes, not yet taking into account the comparison with the companies that did not experience any changes in business model. The distribution of the adapted sub-sample over sectors and company background is given in Table II. It consists of 400 observations. In a first part of the analysis,

we restrict ourselves to this adapted sub-sample. In a second part, we further test the hypotheses put forward in this paper by complementing the sub-sample with various runs of randomly chosen businesses that never changed their business model. Using this procedure, we are able to overcome the overrepresentation of businesses that never changed their business model in the overall sample leading to problems of statistical interpretation and validity (similar to Jackknife procedure, Tabachnik & Fidel, 1996, p. 328).

- INSERT TABLE II ABOUT HERE -

For our sub-sample consisting of 400 observations relating to companies that at least had one change in their business model, we estimated the hazard that a business does not survive (i.e. that it goes out of business, that it is taken over by another company, or that CorpTech is unable to recontact it) through Cox regression. To avoid the problem of causal ambiguity, we used a one-year time lag between the time-dependent covariates on the one hand and the status of the company (whether or not it survived) on the other hand. In a first regression model, we investigated the relationship between the score on Factor 1, Factor 2 and Factor 3 at time t and the sector and (in)dependence of the business on the one hand, and the hazard at time t+1 on the other hand. We also included interaction effects between (in) dependence and the factors representing adaptation, and also between sector and the factors representing adaptation. The results are shown in Figure 6.

We find that the sector of the company and whether or not it is independent do not have a significant direct effect on the hazard rate. This means that we can reject our Hypotheses 2b and 3a. We must note however that a direct effect of (in)dependence may be obscured because of a lack of detail in the CorpTech data. Indeed, the CorpTech data does not allow us to measure the similarity between a new business units activity and that of its parent organization. Because of possibly negative as well as positive effects of imprinting from the parent organization on the new business unit, it may be that new business units operating in different product-market environments as their parent have a smaller chance of surviving than independent ventures, which in turn may have a smaller chance of surviving than new business units operating in environments similar to those of their parent organizations. For unrelated business units, imprinting may give rise to inertia, inhibiting development and success. For related business units, the positive effects of parental imprinting may gain the upperhand. Indeed, Feeser and Williard (1990) found that new technology-based business units which obtained high growth were similar to their parents in both the technology utilized and the markets served.

We find that Factor 1, Factor 2, and Factor 3 all have a positive and significant effect on failure rates. The fact that both Factor 1 and Factor 2 have a significant effect means that there is a cumulative effect of product/service changes over multiple years. We could not study this distinction between yearly and cumulative adaptation of target markets, since both are represented by Factor 3.

When we look at the interaction effects, we see that this negative main effect of adaptation is highly moderated by sector. Our Hypothesis 3b is supported. The positive effect of cumulative changes in products (Factor 1) on the hazard is reversed for companies in the automation and biotech sector (represented respectively by the SEC1 and SEC2 dummies). The positive effect of changes in target markets (Factor 3) on the hazard almost cancels out for companies in the automation sector and is even reversed for businesses in the biotech sector. Similar although statistically insignificant tendencies are found for yearly changes in products (Factor 2). Our findings suggest that the need for adaptation is key in immature, capital-intensive and high-velocity industries such as the biotech industry. However, adaptation appears detrimental in mature, stable industries such as the environmental sector.

We also find significant interaction effects between adaptation and (in) dependence. The positive effects of Factor 1, Factor 2, and also Factor 3 on the hazard of failing are significantly reduced for business units of established companies, meaning that adaptation reduces failure rates in dependent business units as compared to in independent ventures. This supports our Hypothesis 2a. There hence appears to be faster or more efficient learning or adaptation in business units of existing organizations as compared to in independent business ventures. Also here it would have been opportune to investigate whether the similarity between parent and daughter organization is relevant in this respect. Monitoring by the parent organization may restrict adaptation to certain (related) business models, which may render adaptation in non-related business units less efficient.

We can conclude that the total effect of adaptation on failure rates differs greatly depending on the (in) dependence and the industry of the business (see Table III). Adaptation therefore is not a goal in itself. On the contrary, the need for adaptation is highly company and sector specific.

- INSERT TABLE III ABOUT HERE -

In a second regression model, we added the number of employees as a time-varying control variable (also shown in Figure 6). The size of the firm represented by the number of employees does not have a

significant effect on the hazard. The estimates for the other variables are very similar to the ones found in our first model.

In a third regression model (also shown in Figure 6), we added the squared Factor 1, squared Factor 2, and squared Factor 3 to test for a nonlinear relationship between adaptation and failure rates. We find no significant effect of these quadratic terms on the hazard and we therefore reject our Hypothesis 1.

- INSERT FIGURE 6 ABOUT HERE -

In a second part of our analysis, we randomly selected 10 companies that had never changed their business model. We added them to the adapted sub-sample and re-ran our analysis. We repeated this procedure five times. In this way we are able to overcome the overrepresentation of non-adapted businesses in the overall sample leading to problems of statistical interpretation and validity (similar to Jackknife procedure, Tabachnik & Fidel, 1996, p. 328). The results for these five Cox-regressions are shown in Figure 7. The regression coefficients remain comparable over the different samples and for some terms statistical significance is also preserved. More specifically, the interaction effects of Factor 1 (cumulative changes in products) and factor 2 (changes in target markets) with sector/industry remain significant in the majority of the samples. Also the interaction effect between the various forms of adaptation (as represented by Factor 1, Factor 2 and Factor 3) and (in) dependence is statistically significant in the majority of the samples. The results in Figure 7 hence support the robustness of our findings.[iii]

- INSERT FIGURE 7 ABOUT HERE -

DISCUSSION AND MANAGERIAL IMPLICATIONS

We performed a factor analysis of 117 businesses and a total of 681 observations. We demonstrated that new businesses that made at least one adaptation to their initial business model have a significantly higher probability of surviving than businesses that never made any adaptation at all.

We then analyzed in detail the effect of adaptation on new businesses' failure rates. Through factor analysis, we found that adaptation to a company's initial business model can be factored into three components: cumulative changes in products or services, yearly changes in products or services, and

changes (both cumulative and yearly) in target markets. We found that all three factors have a significant main effect on failure rates, indicating that there exists not only a simple, but also a cumulative or learning effect of adaptation with respect to products or services. These effects of adaptation on the hazard of failure are positive.

However, we find that these relationships are significantly moderated by the sector of the business and by whether or not the business is independent. Whereas adaptation can be detrimental for a certain type (independent versus dependent) of business in a certain sector, the opposite may be true for a different type of business in the same or in a different industry. In general, adaptation has a negative effect on failure rates in biotech businesses, and a positive effect in environmental businesses. In the automation sector, the effect can be negative or positive depending on the (in) dependence of the business. Our findings suggest that the need for adaptation is key in immature, capital-intensive and high-velocity industries such as the biotech industry. However, adaptation appears detrimental in mature, stable industries such as the environmental sector. In general, the effect of adaptation also differs between independent businesses and business units of established companies. The interaction effect between adaptation and (in) dependence is negative, meaning that adaptation reduces failure rates in dependent business units as compared to independent ventures. Also here we find that interaction effects are significant for cumulative as well as for yearly changes, indicating again the presence of a learning effect. There hence appears to be faster or more efficient learning or adaptation in business units of existing organizations as compared to independent business ventures. It would have been opportune to investigate whether the similarity between parent and daughter organization is relevant in this respect. Monitoring by the parent organization may restrict adaptation to certain (related) business models, which would render adaptation in non-related business units less efficient. Unfortunately, the nature of the CorpTech data did not allow us to study similarities between the parent company and its business units.

The findings that the effect of adaptation is highly dependent on the sector in which a new business is operating and on whether it is an independent business or a business unit of an established company, has some serious implications for entrepreneurial management. Existing literature suggests that adaptation is a necessary condition for survival. Our research clearly indicates that this cannot be taken as a general rule. Adaptation is not a goal in itself. On the contrary, the need for adaptation is highly company-specific. New businesses will feel more or less need to adapt their initial business model depending on the industry they are in and on whether they were set up independently or as part of an established organization. In general, our findings suggest that the need for adaptation is higher in immature, capital-intensive and high-velocity

industries and that adaptation is more beneficial for business units of established companies than for independent ventures.

Contrary to findings in the existing literature, we did not find a curvilinear relationship between adaptation and new business's hazard of failing. There are two possible explanations for this. Firstly, existing research has not used samples of very young and small companies. This could mean that, although over-adaptation is a concern in medium-sized and large established companies, high degrees of adaptation are not dangerous in new, small companies. A second explanation might be that due to resource constraints, new businesses would not easily succeed in adapting their business model. This would mean that although high degrees of adaptation might lead to higher failure rates, this is not an issue since new businesses do not have the resources to engage in over-adaptation. A third possibility is that existing research focuses on the relationship between adaptation and performance in terms of sales, profits, etc. In our analysis, we used survival as the outcome variable. It might be that over-adaptation indeed leads to a decline in sales or profits, but that this decline is not significant enough to threaten the survival of over-adapting businesses.

We did not find a direct effect of sector, (in) dependence and firm size on businesses' failure rates. The absence of a direct effect of firm size and (in)dependence suggest that liabilities of newness and smallness do not have a direct effect on survival, contrary to the accepted view in the literature. However, it might be the case that they do have an indirect effect by affecting the adaptive potential of the new business. This is something that needs further research. In addition, we must note that a direct effect of (in)dependence on survival may be obscured because the Corptech data do not allow us to take into account similairities between business units and their parent organizations.

LIMITATIONS AND SUGGESTIONS FOR FURTHER RESEARCH

An important advantage of the CorpTech database is that it contains yearly data for companies over time. Such longitudinal data are relatively difficult to find for young businesses. However, the database also has its limitations. We were able to discern between independent start-ups and business units of established companies. However, it would also be interesting to look at spin-outs of universities and research institutes. These companies are listed in the CorpTech database as independent businesses. The same goes for spin-outs of established companies. In addition, the CorpTech data do not allow us to look at similarities between the activities of business units and the activities of their parent organization. We were therefore not able to

discern between positive and negative effects of parental imprinting on business units, although these effects may influence the direct effect of (in)dependence on performance, as well as the interaction effect of (in)dependence and adaptation.

Another disadvantage of the CorpTech database is that is does not contain reliable information on the financials of the businesses. Because most businesses in our sample are very young and small, we were not able to find financial information in other data sources. This means that we cannot control for the effects of e.g. financial slack on the hazard of dying. Also, there are no other performance indicators beside the survival or failure of a business. An additional limitation of our research is that we used sector dummies to look at interaction effect of adaptation and sector. Further research should have separate, more fine-grained indicators of industry maturity, capital intensity, and technological opportunity in order to disentangle the individual effects of these sector characteristics.

We believe that the selection of our sample added to the existing literature, mainly because the businesses under study were on average only 1.5 years old when they entered our database. However, the sample we used is relatively small. Further research should validate our findings for a larger sample of new businesses.

Additional suggestions for further research emerge from our findings. Firstly, the fact that we did not find a curvilinear relationship between adaptation and survival deserves more attention. Secondly, our results suggest that liabilities of newness and smallness (as represented by company size) do not have a direct effect on survival, contrary to the accepted view in the literature. New studies should investigate whether the effect found in previous research is actually an indirect one, caused by the effect of smallness and newness on the adaptive potential of the new business.

APPENDIX 1

Cox-regression for randomly enlarged samples (20 companies added)

	Parameter Estimate		
Variable	Model 1 n=520	Model 2 n=503	Model 3 n=482
Sec1	-0.7101	-1.0687 *	-0.5038
Sec2	-1.4983	-1.8607 *	-1.8187 *
Dep	-0.3794	-0.9219	0.1004
Fact1	1.2233 *	0.5908	1.3345 **
Fact2	0.8856	0.0439	1.0100
Fact3	7.4238 *	4.4847	8.5769 *
Fact1 x sec1	-1.2278	-0.6668	-1.4785 *
Fact1 x sec2	-18.3680	-21.3520 *	-16.4136
Fact2 x sec1	-0.5211	0.1654	-0.7720
Fact2 x sec2	-6.585	-7.3048 *	-5.7980
Fact3 x sec1	-6.8348	-4.2553	-8.4414 *
Fact3 x sec2	-94.9299 *	-110.7177 *	-85.6604
Fact1 x dep	-0.8949	-0.2896	-1.2729 *
Fact2 x dep	-0.9754	-0.4827	-1.2480 *
Fact3 x dep	-5.6887	-2.7341	-7.3876

(*) significant at 0.10 level
(**) significant at 0.05 level

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TABLES

	Automation	Biotech	Environmental
Independent	27	16	22
Business unit of established company	15	16	21
Total	42	32	43

Table I: Sample distribution (Number of companies)

	Automation	Biotech	Environmental
Independent	18	12	8
Business unit of established company	7	9	8
Total	25	21	16

Table II: distribution of companies for adapted sub-sample

	Automation	Biotech	Environmental
Independent	*Fact1: 1.648-1.8087 (-)* *Fact2: 1.4431-1.0737 (+)* *Fact3: 10.3426-10.1384 (+)*	*Fact1: 1.6487-21.3076 (-)* *Fact2: 1.4431-8.0832 (-)* *Fact3: 10.3426-112.1567 (-)*	*Fact1: 1.6487 (+)* *Fact2: 1.4431 (+)* *Fact3: 10.3426 (+)*
Business unit of established company	*Fact1: 1.6487-1.8087-1.3867 (-)* *Fact2: 1.4431-1.0737-1.3043 (-)* *Fact3: 10.3426-10.1384-8.3730 (-)*	*Fact1: 1.6487 - 21.3076 - 1.3867 (-)* *Fact2: 1.4431 - 8.0832 - 1.3043 (-)* *Fact: 10.3426 - 112.1567 - 8.3730 (-)*	*Fact1: 1.6487 - 1.3867 (+)* *Fact2: 1.4431 - 1.3043 (+)* *Fact3: 10.3426 - 8.3730 (+)*

Table III: Effect of adaptation on hazard of failing

FIGURES

Descriptives

	chmkt	cchmkt	chom	cchom	chps	cchps	chcorp	cchorp	chsic	cchsic	chprod	cchprod
mean	0,0279	0,1322	0,0103	0,0485	0,0264	0,1160	0,3348	1,4670	0,2261	0,7526	0,3319	1,4993
Std dev	0,1648	0,3798	0,1009	0,2149	0,1605	0,3715	1,0429	2,6143	1,0220	1,9023	1,1587	3,0598

Correlations

	chmkt	cchmkt	chom	cchom	chps	cchps	chcorp	cchorp	chsic	cchsic	chprod	Cchprod
chmkt	1	0,4578	0,6015	0,2940	0,1388	0,1873	0,2279	0,1165	0,1862	0,1388	0,2133	0,1240
cchmkt	0,4578	1	0,2714	0,6061	0,1115	0,3602	0,1183	0,2873	0,1114	0,3257	0,1274	0,2835
chom	0,6015	0,2714	1	0,4516	-0,0168	0,1643	0,0930	0,0765	0,1048	0,0984	0,0965	0,1119
cchom	0,2940	0,6061	0,4516	1	0,0054	0,2427	-0,0003	0,0670	-0,0042	0,0693	0,0180	0,1041
chps	0,1388	0,1115	-0,0168	0,0054	1	0,4910	0,4477	0,2228	0,4982	0,2437	0,4746	0,2425
cchps	0,1873	0,3602	0,1643	0,2427	0,4910	1	0,2754	0,5574	0,3058	0,5791	0,3238	0,6463
chcorp	0,2279	0,1183	0,0930	-0,0003	0,4477	0,2754	1	0,4652	0,8776	0,4314	0,9277	0,4263
cchorp	0,1165	0,2873	0,0765	0,0670	0,2228	0,5574	0,4652	1	0,3954	0,9137	0,4420	0,9305
chsic	0,1862	0,1114	0,1048	-0,0042	0,4982	0,3058	0,8776	0,3954	1	0,4598	0,8177	0,3692
cchsic	0,1388	0,3257	0,0984	0,0693	0,2437	0,5791	0,4314	0,9137	0,4598	1	0,4023	0,8450
chprod	0,2133	0,1274	0,0965	0,0180	0,4746	0,3238	0,9277	0,4420	0,8177	0,4023	1	0,4742
cchprod	0,1240	0,2835	0,1119	0,1041	0,2425	0,6463	0,4263	0,9305	0,3692	0,8450	0,4742	1

Figure 1: Descriptive statistics and correlations

Kaiser's Measure of Sampling Adequacy: Overall MSA = 0.68592579

3 factors will be retained by the MINEIGEN criterion.

Rotated Factor Pattern

	Factor1	Factor2	Factor3
chmkt	-0.01496	0.24000	0.76226
cchmkt	0.34515	-0.02103	0.71099
chom	-0.02256	0.08268	0.77379
cchom	0.11280	-0.11632	0.77213
chps	0.17697	0.61077	0.03780
cchps	0.69401	0.20700	0.24665
chcorp	0.22082	0.92447	0.04954
cchcorp	0.92313	0.24081	0.02564
chsic	0.20380	0.90252	0.04436
cchsic	0.89752	0.24706	0.05949
chprod	0.23704	0.90420	0.05851
cchprod	0.91941	0.23270	0.06146

Final Communality Estimates: Total=8.808892

Root Mean Square Off-Diagonal Residuals: Overall = 0.07829047

Standardized Scoring Coefficients

	Factor1	Factor2	Factor3
chmkt	-0.11013	0.08603	0.33911
cchmkt	0.08455	-0.08260	0.29173
chom	-0.08602	0.02374	0.34767
cchom	0.00374	-0.08065	0.33954
chps	-0.04128	0.21408	-0.00803
cchps	0.22070	-0.04470	0.05123
chcorp	-0.08066	0.33256	-0.01182
cchcorp	0.32405	-0.06806	-0.06700
chsic	-0.08314	0.32684	-0.01238
cchsic	0.30997	-0.06157	-0.04986
chprod	-0.07128	0.32133	-0.00874
cchprod	0.32113	-0.07130	-0.05048

Figure 2: Results of factor analysis

Full Sample

	Sec1	Sec2	Dep	Empl	Fact1	Fact2	Fact3
Mean	0,377	0,276	0,435	81,278	1,236	0,011	-0,161
Std dev	0,485	0,447	0,496	323,338	2,302	0,843	0,422

Adapted Sub-sample

	Sec1	Sec2	Dep	Empl	Fact1	Fact2	Fact3
Mean	0,372	0,365	0,383	105,322	2,104	0,018	-0,274
Std dev	0,484	0,482	0,487	412,649	2,684	1,100	0,522

Non-adapted Sub-sample

	Sec1	Sec2	Dep	Empl	Fact1	Fact2	Fact3
Mean	0,384	0,149	0,509	46,381	0	0	0
Std dev	0,487	0,357	0,501	85,874	0	0	0

Figure 3: Descriptive statistics and correlations

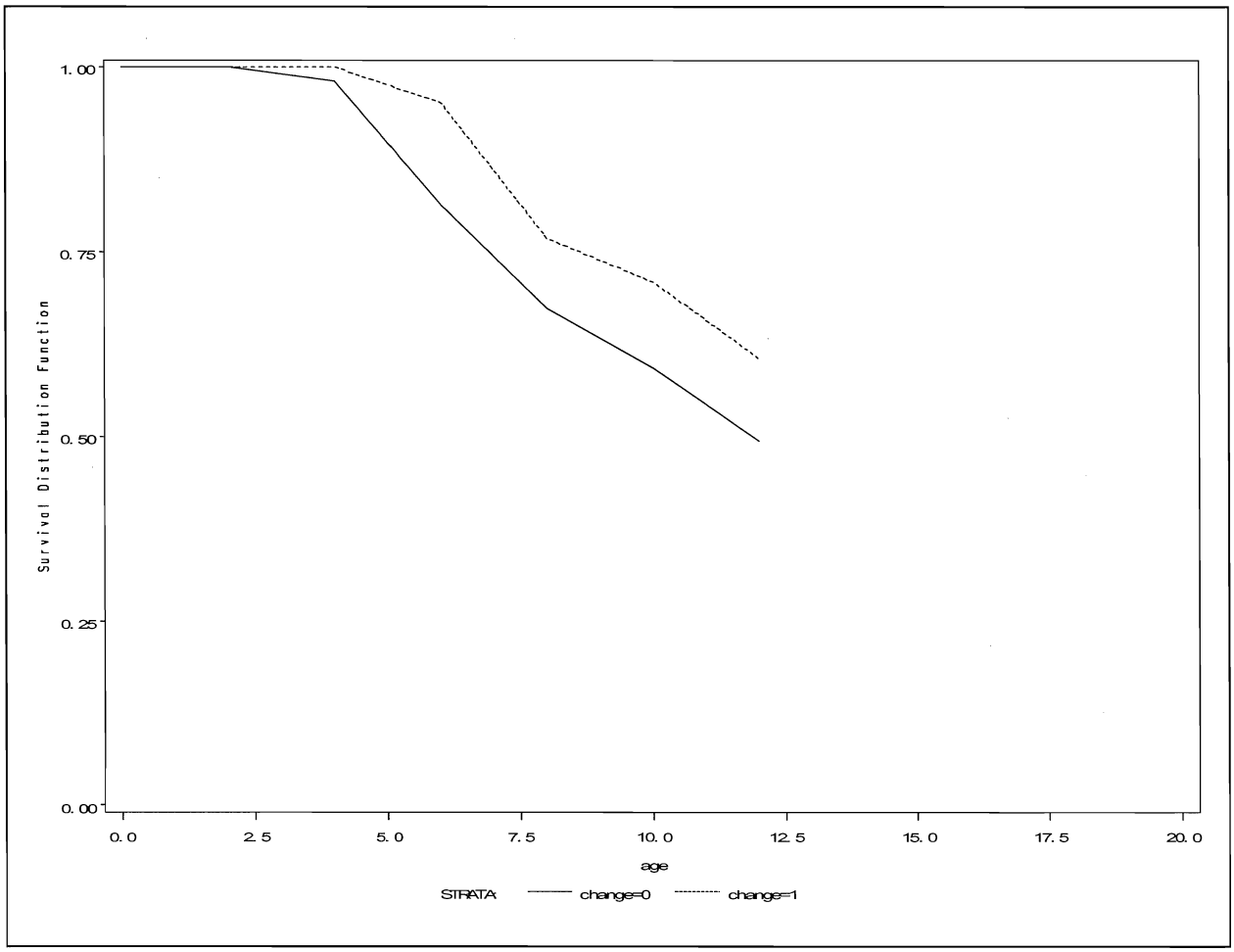

Figure 4: Survival curves of adapted (dotted line) and non-adapted (full line) sub-samples

Test of Equality over Strata

Test	Chi-Square	DF	Pr > Chi-Square
Log-Rank	2.8885	1	0.0892
Wilcoxon	3.4409	1	0.0636

Figure 5: Equality test for survival of adapted and non-adapted sub-samples

	Parameter Estimate		
Variable	Model 1	Model 2	Model 3
Sec1	-0.5474	-0.3068	-0.0967
Sec2	-2.9445	-3.5399	-3.5308
Dep	-0.1573	-0.0055	0.2782
Empl		-0.0003	-0.0002
Fact1	1.6487 **	1.6531 **	1.0621
Fact2	1.4431 *	1.4353 *	1.3182
Fact3	10.3426 **	10.3860 **	7.3690
$(Fact1)^2$			0.0553
$(Fact2)^2$			-0.1328
$(Fact3)^2$			-0.7240
Fact1 x sec1	-1.8087 **	-1.8706 *	-1.4020
Fact1 x sec2	-21.3076	-8.4064	-8.4639
Fact2 x sec1	-1.0737	-1.0705	-0.5870
Fact2 x sec2	-8.0832	-2.9641	-2.6591
Fact3 x sec1	-10.1384 **	-10.5398 **	-7.1083
Fact3 x sec2	-112.1567 *	-46.9262	-46.9615
Fact1 x dep	-1.3867 *	-1.4403 *	-0.9694
Fact2 x dep	-1.3043 *	-1.3233 *	-0.9814
Fact3 x dep	-8.3730 *	-8.5363 *	-5.0677

(*) significant at 0.10 level
(**) significant at 0.05 level

Figure 6: Cox-regression for adapted sub-sample

	Parameter Estimate					
Variable	Model 1 n=400	Model 1b n=457	Model 1c n=464	Model 1d n=448	Model 1e n=447	Model 1f n=433
Sec1	-0.5474	-0.8848	-0.8018	-0.6909	-0.6581	-0.7302
Sec2	-2.9445	-3.5297 **	-1.3049	-1.6596	-0.7312	-3.4333 *
Dep	-0.1573	-0.6849	0.2599	-0.4735	-0.1114	0.0774
Fact1	1.6487 **	1.4212 **	1.4770 **	0.5974	1.5639 **	1.3560 **
Fact2	1.4431 *	1.1169	1.1155	0.1004	1.3198 *	1.0075
Fact3	10.3426 **	9.4876 **	8.7585 *	4.4678	9.8656 **	8.8360 *
Fact1 x sec1	-1.8087 **	-1.6225 *	-1.3461	-0.7700	-1.6682 *	-1.4373 *
Fact1 x sec2	-21.3076	-24.4658 *	-16.5864	-18.9555 *	-15.7117	-21.1989
Fact2 x sec1	-1.0737	-0.7564	-0.6108	-0.0068	-0.9745	-0.7319
Fact2 x sec2	-8.0832	-9.2308 *	-5.8610	-6.3734	-5.4653	-7.8073
Fact3 x sec1	-10.1384 **	-9.3096 *	-7.9841 *	-4.7137	-9.4527 *	-8.5390 *
Fact3 x sec2	-112.1567 *	-129.3244 *	-85.3928	-97.9981 *	-79.6126	-112.5033 *
Fact1 x dep	-1.3867 *	-1.1416	-1.3016 *	-0.3834	-1.3659 *	-1.3367 *
Fact2 x dep	-1.3043 *	-1.1000	-1.2066 *	-0.5584	-1.3249 *	-1.2179 *
Fact3 x dep	-8.3730 *	-7.64917 *	-7.1373	-2.8269	-8.1271 *	-7.6880 *

(*) significant at 0.10 level
(**) significant at 0.05 level

Figure 7: Cox-regression for randomly enlarged samples (10 companies added)

NOTES

[i] Audretsch and Mahmood (1995), contrary to the liability of newness and smallness argument above and also contrary to their own expectations, find that survival rates are lower for establishments which are a branch or a subsidiary of an existing enterprise than for new independent enterprises. Their paper does not comment on this finding however.

[ii] Pitt and Kannemeyer (2000) also consider distribution, facility or space requirements, marketing approach, and personnel resources as components of the marketing strategy. Morris et al. (1999) regard financial requirements as an additional component. However, these appear organizational requirements for a company to adapt its business model, but not dimensions of the (adapted) business model.

[iii] We also randomly selected 20 non-adapted companies, added them to the adapted sub-sample and re-ran our analysis. We did this three times. Each time, the signs and magnitudes of the effects were preserved, although significance was somewhat lower than when analyzing the initial sub-sample of adapted businesses (see Appendix 1).